

What is claimed:

1. A method of friction welding first and second parts together having a specific axial orientation relative to each other in which said first part is mounted to a spindle for axial rotation said second part is mounted to a non-rotatable holder moveable toward said spindle along the axis of rotation of said first part, comprising the steps:

- a. causing said spindle and mounted first part to be rotated at a desirable speed while determining the angular axial orientation of said first part relative to said second part at any specific time,
- b. moving said holder toward said spindle to bring said second part into frictional contact with said first part at a selected one said specific time to cause heating of said first and second parts and the melting of the respective contacting surfaces thereof,
- c. then decreasing the speed of rotation of said spindle and mounted first part and simultaneously moving said holder towards said spindle to forcibly urge said first and second parts together at said contacting surfaces, and
- d. stopping rotation of said spindle and mounted first part at a specific determined angular axial orientation of said first part relative to said second part while still forcibly urging said first and second parts together to allow cooling and fused solidification of said contacting surfaces.

2. The method of claim 1 wherein step b includes bringing said first and second parts into frictional contact at a first pressure force with the combined axial length of said first and second parts being reduced a specific distance followed by a second pressure force greater than said first pressure force with the combined axial length of said first and second parts being further reduced a second specific distance while maintaining said first desirable speed.

3. The method of claim 2 wherein step c also includes applying a third pressure force greater than said second pressure force to said first and second parts with the combined axial length of said first and second parts being reduced a third specific distance.

4. The method of claim 3 including monitoring the angular axial orientation of said first part relative to said second part during steps a, b, c, and d.

5. The method of claim 4 wherein step d includes applying a forge force to said first and second parts for a specific dwell time.

6. The method of claim 1 including determining responsive to one or more material characteristics of said first and second parts said desirable speed, said one specific time, and amount of force utilized to so force said first and second parts together during rotation of said spindle and mounted first part.

7. The method of claim 1 including monitoring said angular axial orientation of said second part of said first and second parts relative to each other and adjusting the rotational speed of said spindle to arrive at said specific determined angular axial orientation of said first part relative to said second part.

8. The method of claim 1 including adjusting the rotational speed of said spindle during steps b to effect said melting of the contacting surfaces of said first and second parts.